

Claims

1. Measuring tool for measuring magnetic properties of a magnetic sample in a closed loop, comprising

- an electromagnet (1) in a closed loop arrangement with two pole pieces (3) connected to a yoke (2), said pole pieces (3) forming a gap (4) for the placement of the sample (5),
- a search coil (6) for the measurement of a flux density B of the sample (5) and
- a magnetic field sensor (7) for the measurement of a magnetic field strength H in the gap (4) between said pole pieces (3),

characterized in that

the pole pieces (3) comprise heater elements (8) for heating the pole pieces (3) to temperatures of at least 450° C, the pole pieces (3) are thermally insulated against the yoke (2) of the electromagnet (1), and the pole pieces (3), the search coil (6) and the magnetic field sensor (7) are made of materials which resist said high temperatures.

2. A measuring tool according to claim 1,

characterized in that

the search coil (6) is made using thick-film technology.

3. A measuring tool according to claim 2 ,

characterized in that

the search coil (6) is made of two concentric flat coil elements (6a, 6b) of equal turn areas arranged one above the other and separated by an insulating layer (9) having a via through which the two flat coil elements (6a, 6b) are connected.

4. A measuring tool according to one of claims 1 to 3,

characterized in that

the magnetic field sensor is a flat coil (7).

5. A measuring tool according to claim 4,

characterized in that

the coil (7) of the magnetic field sensor is made using thick-film technology.

6. A measuring tool according to claim 5,

characterized in that

the coil (7) of the magnetic field sensor and the search coil (6) are arranged on a common substrate (10).

7. A measuring tool according to one of claims 1 to 6,

characterized in that

each of the pole pieces (3) consist of a base piece (11) for the connection to the yoke (2), a pole piece body (12) forming the closed magnetic circuit with the sample (5), an insulating layer (13) between the base piece (11) and the pole piece body (12) for a reduction of heat losses and at least one heater element (8) integrated in the pole piece body (12).

8. A measuring tool according to claim 7,

characterized in that

the base piece (11) and the pole piece body (12) have a circular cross section round and are machined from pure iron.

9. A measuring tool according to claim 7 or 8,

characterized in that

the insulating layer (13) is made of a material which is mica based and has a density of about 2.2 kg/dm³ and a thermal conductivity of about 0.26 W/mK.

10. A measuring tool according to claim 9,

characterized in that

the insulating layer (13) has lateral dimensions of 100 x 200 mm and is 6-mm thick.